Business Opportunities

in an HLA World

Captain Jim Hollenbach, USN
Defense Modeling and Simulation Office
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Agenda

- Background: DoD M&S Strategy & Master Plan
- The High Level Architecture
- DoD's Transition to the HLA
- Commercial Opportunities
  - HLA transition support
  - HLA runtime software development
  - Software to support the HLA federation development process
  - Systems engineering of HLA federations
  - New Information and Analysis Center (IAC)
- Q&A *(submit by available 3x5 cards)*

DoD M&S Vision

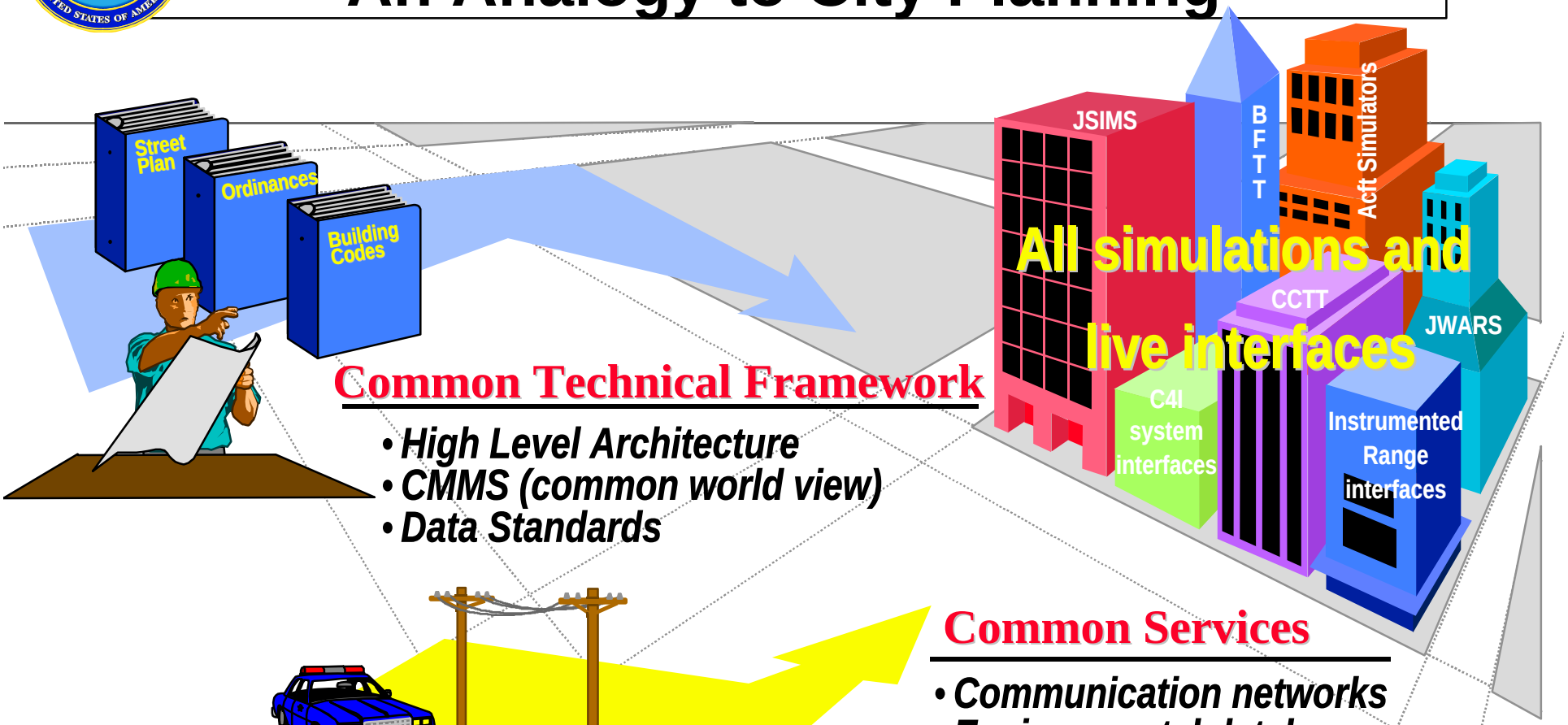
Defense modeling and simulation will provide readily-available, operationally-valid environments for use by DoD components

- **to train jointly, develop doctrine and tactics, formulate operational plans, and assess war fighting situations**
- **as well as to support technology assessment, system upgrade, prototype and full scale development, and force structuring.**

Furthermore, common use of these environments will promote a closer interaction between the operations and acquisition communities in carrying out their respective responsibilities. To allow maximum utility and flexibility, these modeling and simulation environments will be constructed from affordable, reusable components interoperating through an open systems architecture.

DoD Executive Council for Modeling and Simulation (EXCIMS), March 13, 1992

DoD M&S Strategy: An Analogy to City Planning



Common Technical Framework

- *High Level Architecture*
- *CMMS (common world view)*
- *Data Standards*

Common Services

- *Communication networks*
- *Environmental databases*
- *Resource repositories*
- *VV&A policy and procedures*
- *Help Desks (IAC & MSOSA)*
- *Supporting software/tools*

Payoffs: Interoperability and reuse = capability and cost-effectiveness

The Strategy is Being Executed Through a DoD-wide M&S Master Plan

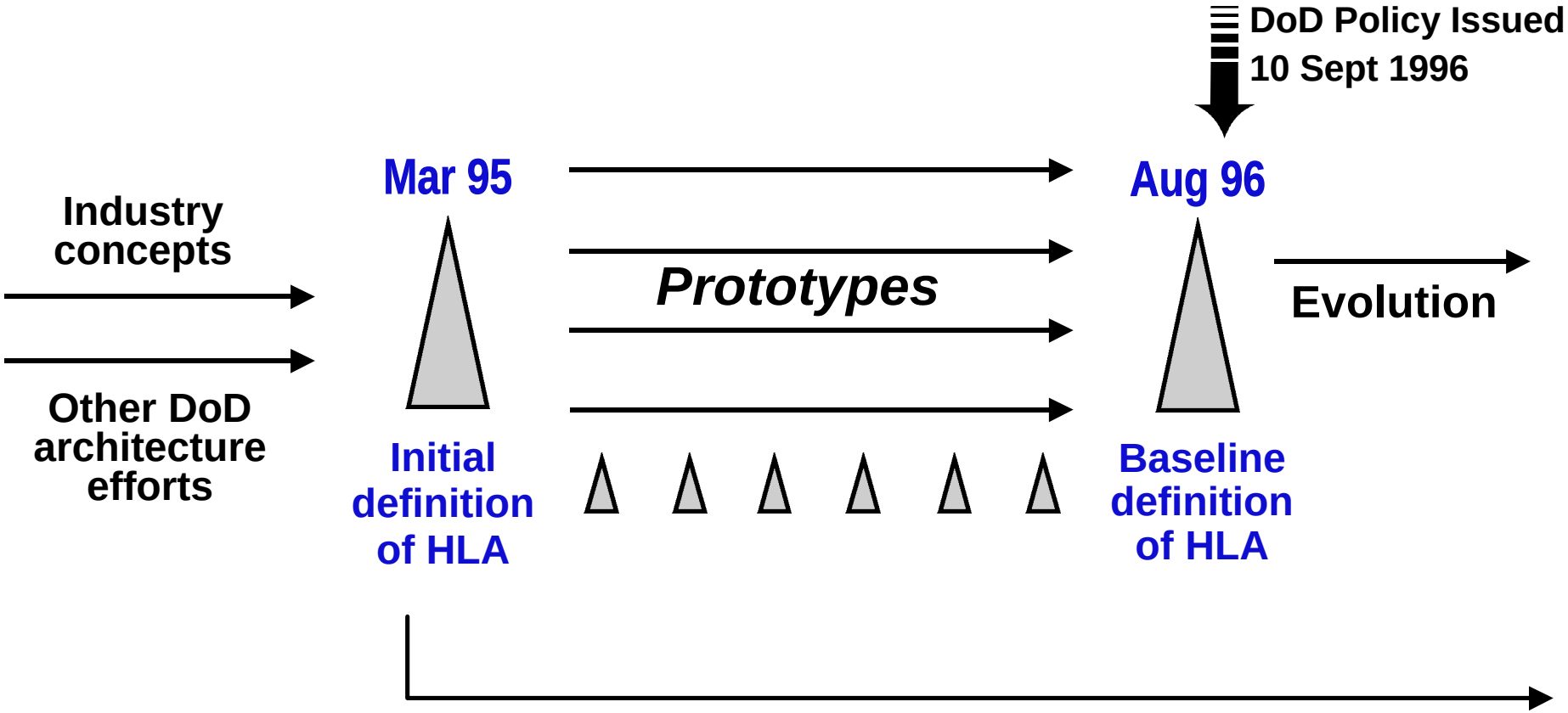
Objective 1	*Objective 2*	*Objective 3*	*Objective 4*	*Objective 5*	*Objective 6*
Develop a common technical framework for M&S	Provide timely and authoritative representations of the natural environment	Provide authoritative representations of systems	Provide authoritative representations of human behavior	Establish a M&S infrastructure to meet developer and end-user needs	Share the benefits of M&S
Sub-objectives	***Sub-objectives***		***Sub-objectives***	***Sub-objectives***	***Sub-objectives***
1-1 High-level architecture	2-1 Terrain		4-1 Individuals	5-1 Field systems	6-1 Quantify impact
1-2 Conceptual models of the mission space	2-2 Oceans		4-2 Groups and organizations	5-2 VV&A	6-2 Education
1-3 Data standards	2-3 Atmosphere			5-3 Repositories	6-3 Dual-use
	2-4 Space			5-4 Communications	
				5-5 Coordination Center	

DoD 5000.59-P, Modeling and Simulation Master Plan, October 1995

DoD M&S Master Plan Objective 1-1

“Establish a common high-level simulation architecture to facilitate the interoperability of all types of simulations among themselves and with C^4I systems, as well as to facilitate the reuse of M&S components.”

High Level Architecture (HLA) Development Process Overview



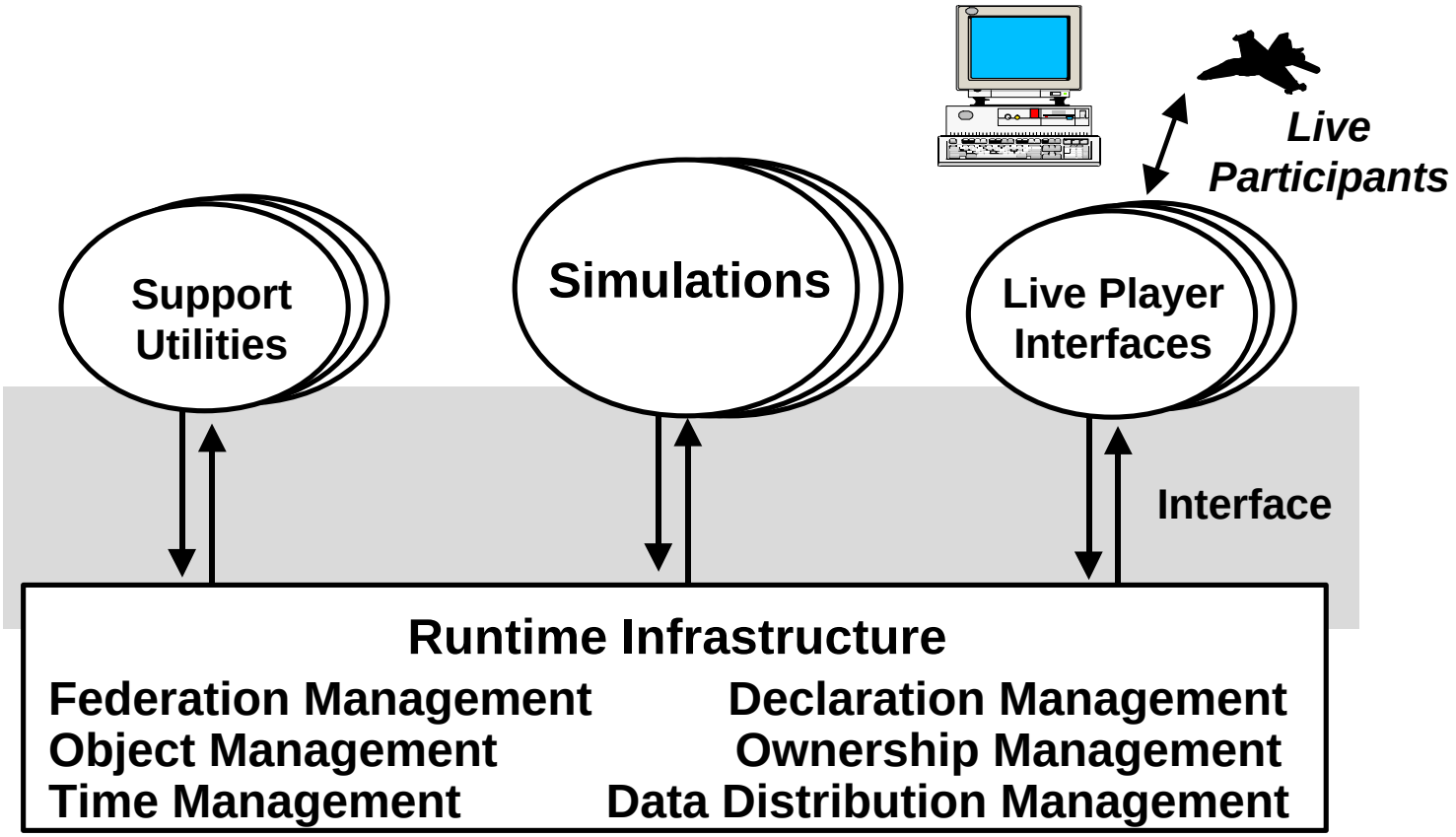
DoD-wide Architecture Management Group

(16 major simulation programs; developers were 35% government, 12% FFRDC, 5% academia, 48% industry)

What is the High Level Architecture?

Major functional elements, interfaces, and design rules, pertaining to all DoD simulation applications, and providing a common framework within which specific system architectures can be defined

Functional View of the Architecture



The HLA is not the RTI; the HLA says there will be an RTI that meets HLA requirements but it doesn't specify a particular software implementation

Defining the HLA

The HLA is comprised of three elements:

- **HLA Rules**

  A set of rules which must be followed to achieve proper interaction of simulations in a federation. These describe the responsibilities of simulations and of the runtime infrastructure in HLA federations

- **Interface Specification**

  Definition of the interface functions between the runtime infrastructure and the simulations subject to the HLA

- **Object Model Template**

  The prescribed common method for recording the information contained in the required HLA Object Model for each simulation and federation

Scope of HLA

- **Applicable to broad range of functional areas (e.g., training, contingency planning, analysis, and acquisition support)**
- **Applicable to simulations involving pure software representations, man-in-the-loop simulators, and interfaces to live components (e.g., instrumented weapon systems and C3 systems)**

The HLA provides a common architecture across a very wide set of simulation applications -- allowing for the reuse of tools, both government and commercial, across a broader range of users

DoD HLA Policy

- **DoD Policy:**

  "Under the authority of [DoD Directive 5000.59], and as prescribed by [the DoD Modeling and Simulation Master Plan], I designate the High Level Architecture as the standard technical architecture for all DoD simulations."

- **HLA supersedes Distributed Interactive Simulation (DIS) and ALSP**

- **"No Can" deadlines for legacy simulations:**
  - **"No Can Pay"- first day of FY99**
    - **no funds for developing/modifying non-HLA-compliant simulations**
  - **"No Can Play"- first day of FY01**
    - **retirement of non-HLA-compliant simulations**

- **Waivers must be decided on a corporate basis**

Dr. Paul Kaminski, USD(A&T)
10 September 1996

Some Benefits of HLA Use

- New capabilities (ownership transfer, smarter data distribution, etc.)
- Same infrastructure and interfaces can be used for a wide variety of simulation applications
  - large and small; real-time and managed time; local and distributed
- Simulations benefit from improvements in infrastructure technologies without having to pay for them
  - improved performance infrastructure can be inserted without an impact on applications
- Different organizations can produce/maintain a diverse set of products (e.g., simulations, live system interfaces, utilities, infrastructure) which can be (wisely) used together in different combinations as user needs dictate
  - yielding reuse of individual products
  - simulations can bring in new capabilities without having to build them

DoD's Transition to HLA

- **Per USD(A&T) policy memo, DoD Components provided 30 June inputs to DMSO regarding HLA transition plans**
- **Very positive reports - strong commitment to HLA compliance**
- **As of today, 407 simulations are committed to HLA compliance, 169 are candidates for long-term waivers, and 178 will be retired**
- **A more complete briefing will be given at 1030 Thursday morning in Salons XI-XIV, "Into the Future: A Report on High Level Architecture Compliance Plans and Progress"**

Commercial Opportunities

- The HLA has been designed and adopted to allow government to make better use of developments, processes and capabilities across a broader set of uses
- This approach brings similar benefits to the commercial market -- both US and international -- by providing a broader market for products and services, in terms of
  - Transition support
  - Runtime software development
  - Software to support the HLA federation development process
  - Systems engineering of HLA federations

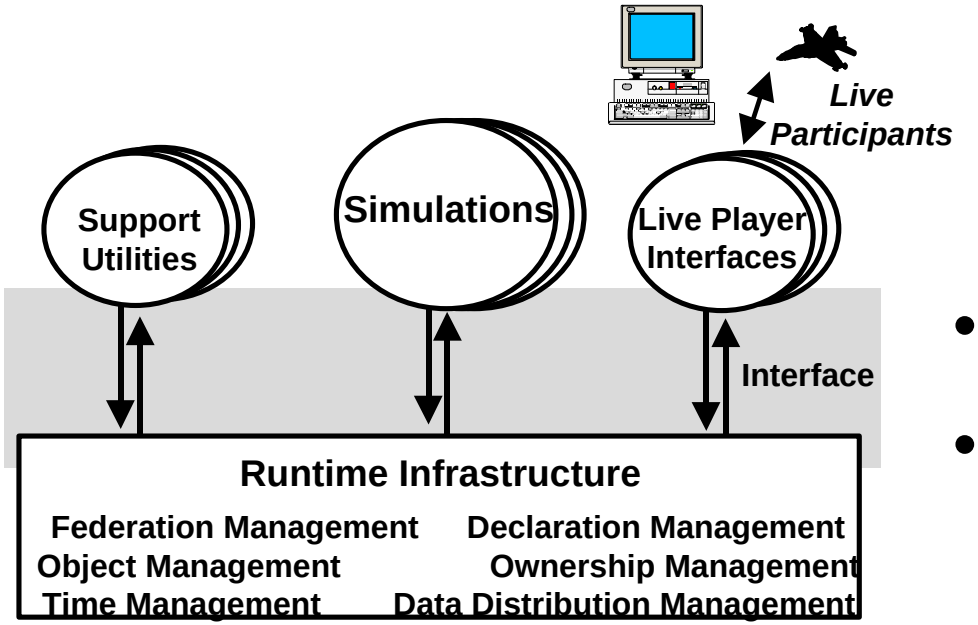
Transition Support

- Several hundred simulations will be adapted over the next few years
- This transition will be undertaken largely by industry in support of government
- Range of opportunities for industry:
  - Transition services
    - Analysis of legacy simulation capabilities and software
    - Simulation Object Model (SOM) development
    - HLA interface software development
  - Reusable software products to support transition
    - HLA/DIS interface toolsets
    - Reusable federate interface software
    - Wrappers for legacy simulations both for HLA and for future development

DMSO Role in HLA Supporting Software

- HLA is an architecture, not software -- however, to facilitate cost-effective implementation of HLA, DMSO is developing an initial suite of HLA supporting software
- Openly distributed in the public domain
  - building a broad base of HLA users, who become a market for other HLA products
- Open access to specifications (e.g., HLA I/F Spec, OMT data interchange format)
  - foster development of commercial software to support HLA
- These developments are designed to create new markets for different types of reusable software

Runtime Software Development



The HLA provides a framework for commercial development of different components of a federation

- **RTI software**
- **Federate development and interface software**
- **Reusable simulations**
- **Simulation support utilities**

Runtime Software Development:

Runtime Infrastructure (RTI) Software

- **DMSO is developing Runtime Infrastructure (RTI) software**
  - **available now at http://hla.dmso.mil**
  - **includes installation and documentation support**
- **DoD simulations are required to use the HLA, which includes the use of RTI software; but the policy does <u>not</u> mandate use of this RTI software**
- **Opportunities exist for commercial development**
  - **functionality and interface specification are defined**
  - **RTI HLA compliance testing will be provided**
  - **Opportunities for RTI product differentiation on performance, portability, support**
    - **<u>but not functionality or interfaces</u>**

Runtime Software Development:

Federate Development and Interface SW

- **Simulations, interfaces to live systems, and support tools all require software interfaces to support HLA**
- **Opportunities exist for**
  - **Simulation development environments which automatically generate HLA documentation (SOM) and interface software**
    - **to support new simulations developments cost-effectively operating with HLA from the outset**
  - **Reusable interface software which provides the interface calls to the RTI with a higher level interface for the federate developer**
    - **to support both adaptation of existing systems and used in development of new HLA federates**

Runtime Software Development:

Reusable Simulations

- **HLA promotes the reuse of simulations developed for one user's requirements for added, different uses**
- **Common architecture across different user communities means a broader user market for individual simulation developments**
  - **Return on investments (government and commercial) for a simulation development can be based on multiple applications (sales) of a simulation**
- **Opens opportunities for classes of reusable simulations which specialize in functionality needed in different types of simulations (e.g., weather, communications, EW effects)**

Runtime Software Development:

Simulation Support Utilities

- As with simulations, the HLA promotes reuse of simulation support utilities developed for one user's requirements for added, different uses
- Again, common architecture across different user communities means a broader user market for individual support utility developments
- Utilities include
  - Data collection tools
  - Viewers
  - Federation managers
  - Runtime monitors

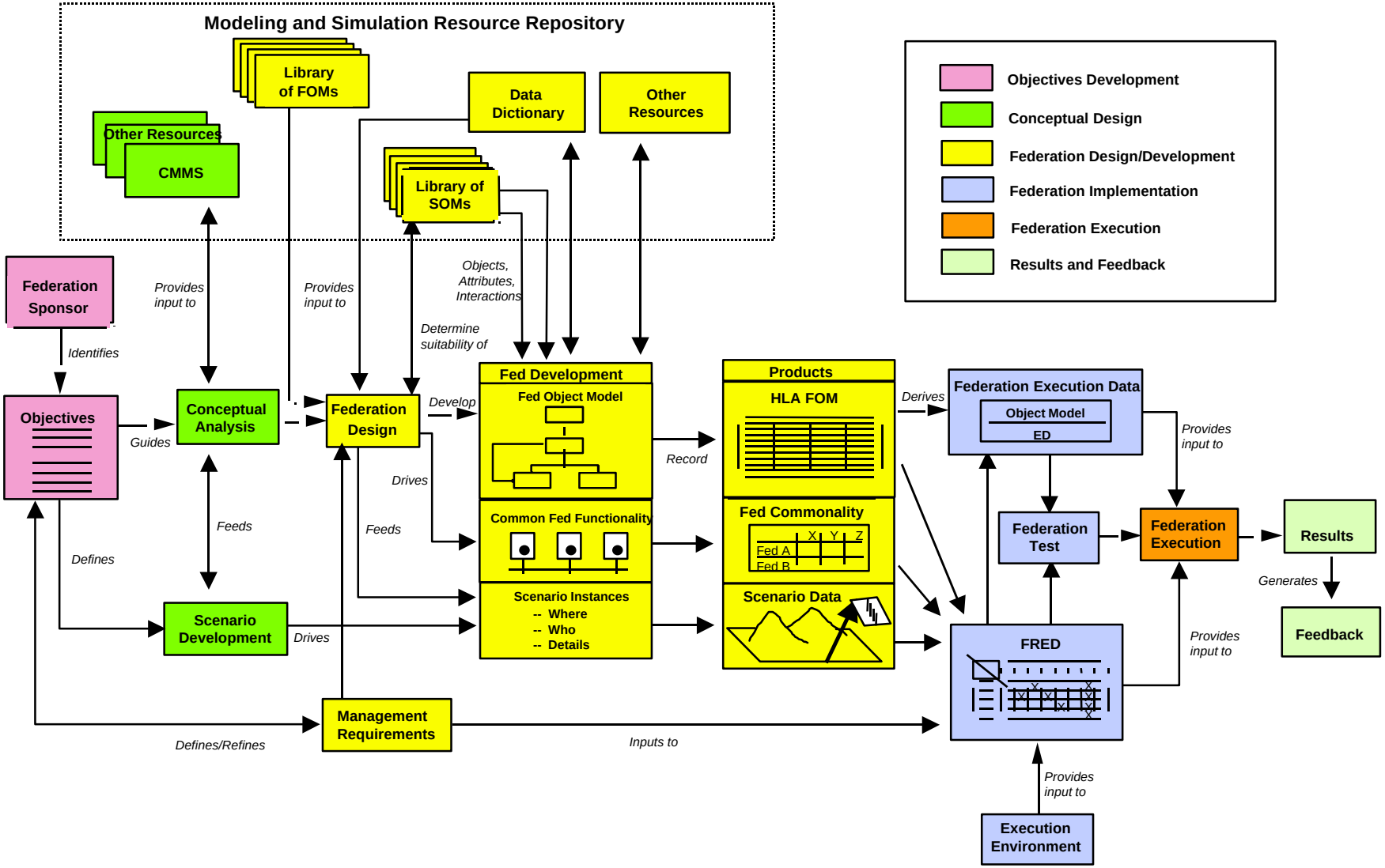
Software to Support the HLA Federation Development Process

- Process of developing a federation is becoming better understood as experience with HLA development grows
- Efforts across the community (AMG, SIW) to understand and document this process
- Increasing awareness of the importance of application of automated tools to make this process both cost-effective and affordable
- Tool architecture has been developed to identify key tool opportunities
- Supporting open data exchange standards (DIFs) are being developed to support tool interoperability
- DMSO is developing initial versions of key tools to demonstrate concept and support transition

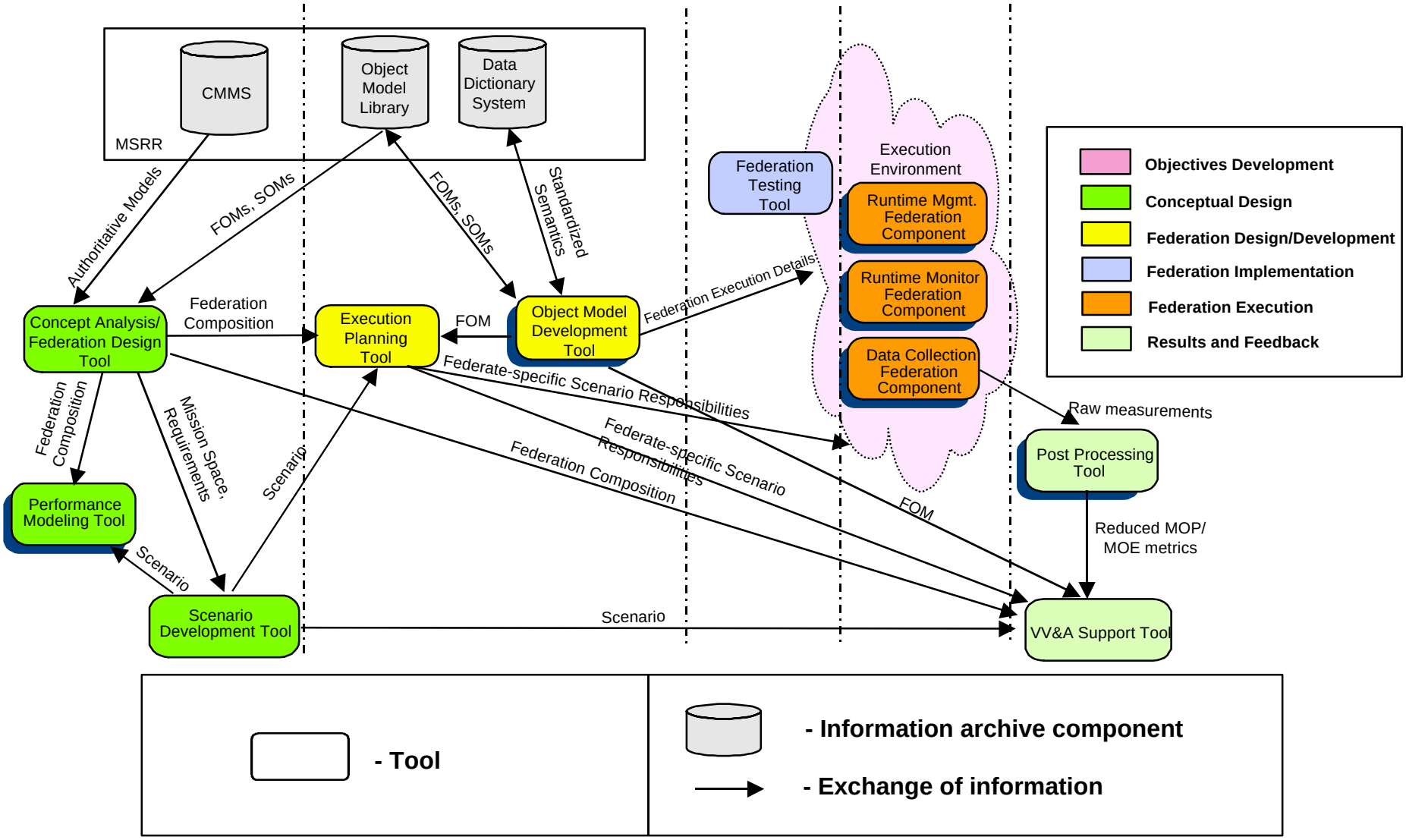
DMSO Development of Object Model Support Tools

- **Object Model Development Tools (OMDTs)**
  - **Automated support for developing HLA Object Models (OMs), generating RTI federation execution data, and exchanging OMs with the Object Model Library**
- **Object Model Library (OML)**
  - **Web-accessible library for storing and retrieving completed HLA object models (SOMs and FOMs)**
- **Object Model Data Dictionary (OMDD)**
  - **An automated catalog of data elements for use in HLA object models**
  - **Part of the data standards leg of the Common Technical Framework (M&S Master Plan Objective 1-3)**
  - **To be linked to Object Model Development Tools**
- **Initial release (of OMDT & OML) occurred on 31 October**

HLA Federation Development and Execution Process (FEDEP) Model



HLA Tool Architecture



Systems Engineering of HLA Federations

- **HLA is rapidly becoming an integral part of other systems development activities including the development and implementation of training exercises, test events, and analyses**
- **The capability of organizations in these and other application areas to effectively engineer HLA systems is becoming an important part of an organizations core capabilities**

International Aspects

- **Much international interest in, and adoption of, the High Level Architecture (HLA)**
- **DoD M&S-related contacts with other nations (within alliance structures, at conferences, and bilateral) have been increasing dramatically.**
  - **UK, France, Japan, Australia, Netherlands, Korea, Germany, Croatia, Romania, Sweden, Israel, Singapore, Canada, Turkey, Norway, many more**
- **NATO is crafting an M&S Master Plan which will embrace the HLA as a NATO standard**

The opportunities discussed previously will exist across an international marketplace

Top Foreign RTI Requestors

UK	35
GERMANY	25
CANADA	20
FRANCE	19
NETHERLANDS	14
SWEDEN	12
AUSTRALIA	6
JAPAN, SINGAPORE (tie)	5
ISRAEL, SPAIN, TAIWAN, SOUTH AFRICA (tie)	3
TURKEY	2

On-Line Documentation

- **Proceedings and products of the HLA on the HLA home page site at:**
  - **http://hla.dmso.mil**
- **Specific questions can be directly addressed to DMSO via electronic mail at:**
  - **hla@msis.dmso.mil**

DMSO HLA Home Page
http://hla.dmso.mil

- General Information
- HLA Policy and Compliance Testing
- HLA Technical Specifications
- Runtime Infrastructure (RTI)
- Federation Development Processes and Tools
- HLA Software Distribution Center
- Data Support for the HLA
- HLA Implementations
- Architecture Management Group (AMG)
- HLA Education and Training
- HLA and External Standards
- Published Papers

Coming Soon: A New M&S Information Analysis Center (MSIAC)

- A new procurement underway later this fiscal year as a cooperative effort between DMSO and the Defense Technical Information Center (DTIC)
- Dedicated to serving the M&S community
- DMSTTIAC M&S-related scientific and technical analysis and MSOSA operational support services will be combined in a “one-stop shopping” M&S IAC.
- Will optionally provide a wide range of other general support services
  - e.g., MSRR technical/management support; education services; HLA compliance testing; impact assessment; software and document distribution; dedicated support tasks

MSIAC Concept

- **Optimize cost-effectiveness by combining functions of MSOSA, M&S functions of DMSTTIAC, MSRR support and several other M&S support functions/requirements in a single support activity.**
- **Provide M&S community general support functions, serve as a readily available "extended staff." Not to be used as a vehicle to build simulations.**
- **Services to span all domains (e.g., Training, Analysis, Acquisition)**
- **Planned operating hours - 12 hours a day, 5 days a week (minimum)**

Tentative MSIAC Business Plan

- Central funding from DMSO to provide core capability and enable initial response to DoD M&S community requests
- Customers provide funding for services past certain threshold (threshold is currently planned for 4 staff hours) and for dedicated support, which could be performed at customer's site
- Customer funding able to be put "on account" with MSIAC for use as needed. Such accounts could be on a component, command or organization basis.
- Support on a 100% customer-funded basis to:
  - Other U.S. Government organizations
  - Commercial firms without a DoD sponsor
  - Allied nations

Summary

- **Execution of the DoD M&S Master Plan is generating major commercial opportunities, including:**
  - **HLA transition support**
  - **HLA runtime software development**
  - **Software to support HLA federation development process**
  - **Systems engineering of HLA federations**
  - **MSIAC**
  - **Others TBD**
- **The market place will extend to the international arena**
- **Seize the opportunity!**

Q&A

Questions?